

WHAT IS CLAIMED IS:

1. A process for the preparation of isoolefin copolymers in the presence of zirconium halides and/or hafnium halides, comprising the step  
5 of polymerizing monomers in the presence of organic acid halides.

2. A process according to Claim 1, wherein said organic acid halide corresponds to the general formula (I)

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$$\text{R-COX} \quad (\text{I}),$$

wherein R is selected from the group consisting of C<sub>1</sub>-C<sub>18</sub>-alkyl, C<sub>3</sub>-C<sub>18</sub>-cycloalkyl and C<sub>6</sub>-C<sub>24</sub>-cycloaryl, and X may be fluorine, chlorine, bromine or iodine.

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3. A process according to Claim 1 wherein the concentration of the organic acid halide in the reaction medium is within the range of 1 to 500 ppm.

20 4. A process according to Claim 1, wherein said zirconium halide is ZrCl<sub>4</sub> and said hafnium halide is HfCl<sub>4</sub>.

5. A process according to Claim 1, wherein isobutene is copolymerized with isoprene and optionally further monomers.

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6. A process according to Claim 1, wherein AlCl<sub>3</sub> or a catalyst system which is preparable from AlCl<sub>3</sub> is additionally utilized.

7. A mixture of zirconium halide and/or hafnium halide and  
30 organic acid halide corresponding to the general formula (I)

R-COX (I),

wherein R is selected from the group consisting of C<sub>1</sub>-C<sub>18</sub>-alkyl, C<sub>3</sub>-C<sub>18</sub>-cycloalkyl and C<sub>6</sub>-C<sub>24</sub>-cycloaryl, and X may be fluorine, chlorine, bromine or iodine.

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8. A catalyst comprising a mixture of zirconium halide and/or hafnium halide and organic acid halide corresponding to the general formula (I)

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R-COX (I),

wherein R is selected from the group consisting of C<sub>1</sub>-C<sub>18</sub>-alkyl, C<sub>3</sub>-C<sub>18</sub>-cycloalkyl and C<sub>6</sub>-C<sub>24</sub>-cycloaryl, and X may be fluorine, chlorine, bromine or iodine.

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9. A polymer which is prepared by the polymerization of monomers in the presence of i) zirconium halides and/or hafnium halides, and also ii) organic acid halides.

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10. A polymer according to Claim 9, wherein said organic acid halide corresponds to the general formula (I)

R-COX (I),

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wherein R is selected from the group consisting of C<sub>1</sub>-C<sub>18</sub>-alkyl, C<sub>3</sub>-C<sub>18</sub>-cycloalkyl and C<sub>6</sub>-C<sub>24</sub>-cycloaryl, and X may be fluorine, chlorine, bromine or iodine.

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11. A polymer according to Claim 9, wherein the concentration of the organic acid halide in the reaction medium is within the range of 1 to 500 ppm.

12. A polymer according to Claim 9, wherein said zirconium halide is  $\text{ZrCl}_4$  and said hafnium halide is  $\text{HfCl}_4$ .

5 13. A polymer according to Claim 9, wherein isobutene is copolymerized with isoprene and optionally further monomers.

14. A polymer according to Claim 9, wherein  $\text{AlCl}_3$  or a catalyst system which is preparable from  $\text{AlCl}_3$  is additionally utilized.

10 15. A polymer according to Claim 9, comprising up to 30 mol% isoprene.

16. A molded body comprising a polymer which is prepared by the polymerization of monomers in the presence of  
15 i) zirconium halides and/or hafnium halides, and also  
ii) organic acid halide.